## REMARKS

Claims 1-11 were pending in the application. Claims 1-11 were rejected. Claims 1-11 are amended. Claim 1 is the independent claim. Reconsideration of the amended application is respectfully requested.

The examiner required amendment of the claims to bring the claim language in conformance with provisions of the MPEP. The claims are amended, and it is respectfully submitted that the amended claim language complies in all respects with the MPEP.

The examiner required the addition of an abstract of the disclosure. An abstract has been added on a separate sheet.

The examiner required amendment of the specification in conformance with content and heading provisions of MPEP 608.01(a). The written description has been amended to amend and add headings as applicable.

The examiner rejected claims 1-11 under 35 USC §101 as being directed to non-statutory subject matter. The claims are amended so as to make it clear that they are not directed merely to abstract ideas, but rather recite a process that results in a practical application producing a tangible result to form the basis of statutory subject matter under 35 USC §101. That is, the claims recite a method for training a neural network. The utility of neural networks is well known, and the method for training the neural network recited in the claims results in at least one practical application, namely, simplification of the structure of the neural network. The advantages of such simplification are noted in the Background section of the present invention, as well as on page 116 of the reference cited by the examiner. The rejection, therefore, should be withdrawn.

The examiner rejected claims 1-11 under 35 USC §112, first paragraph, as not reciting how to practice the invention. Claims 1-11 are amended to recite the invention such that one of ordinary skill in the art can practice the invention. That is, the claimed method for training a neural network is recited as a series of actions performed on a recited structure, resulting in a tangible, practical application, such as that included at the end of claim 1. All of the actions are described such that one of ordinary skill in the art can carry them out, as is the structure on which the actions are preformed. The rejection, therefore, should be withdrawn.

The examiner rejected claims 1-11 under 35 USC §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter that the applicants regard as the invention. The examiner noted particular language that he considers to be indefinite. The claims are amended for improved definiteness, and it is respectfully submitted that the amended claims satisfy the requirements of 35 USC §112, second paragraph. The rejection, therefore, should be withdrawn.

The examiner rejected claims 1-11 under 35 USC §102(b) as being anticipated by Mehrotra et al.

Independent claim 1 recites a method for training a neural network in order to optimize the structure of the neural network. The neural network includes an input layer having a plurality of input neurons that receive the input data, at least one intermediate layer having a plurality of intermediate neurons, an output layer having a plurality of output neurons that provide output signals, and a multiplicity of synapses, wherein each said synapse interconnects two neurons of different layers, defining a sending direction from the input layer to the output layer. The training method includes identifying and

eliminating synapses that have no significant influence on the curve of the risk function. First and second sending neurons are selected that are connected to the same receiving neuron by respective first and second synapses. It is assumed that there is a correlation of response signals from the first and second sending neurons to the same receiving neuron. The first synapse is interrupted and a weight of the second synapse is adapted in its place. The output signals of the changed neural network are compared with the output signals of the unchanged neural network. If the comparison result does not exceed a predetermined level, the first synapse is eliminated, thereby simplifying the structure of the neural network.

Mehrotra et al. disclose the structure of a neural network in Fig. 1.14, as noted by the examiner. On page 116, Mehrotra et al. also disclose "pruning" the network, that is, eliminating nodes and connections that are considered unimportant. In Fig. 4.6, Mehrotra et al. describe a generic pruning algorithm, by which nodes or connections are deleted is the removal does not penalize performance beyond a desirable tolerance level. Mehrotra et al. then outline, on pages 116-118, four procedures that can be used to implement the network pruning methodology. None of these procedures includes selecting first and second sending neurons that are connected to the same receiving neuron by respective first and second synapses, assuming a correlation of response signals from said first and second sending neurons to the same receiving neuron, interrupting the first synapse and adapting in its place a weight of the second synapse, comparing the output signals of the changed neural network with the output signals of the unchanged neural network, and if the comparison result does not exceed a predetermined level, eliminating the first synapse, as recited in claim 1.

The first procedure calls for eliminating connections having weights of small magnitude, as well as eliminating their associated nodes. Presumably, this procedure involves comparing synapse weights against a threshold, and eliminating synapses having weights below the threshold. Mehrotra et al., in describing this procedure, do not disclose selecting two sending neurons, assuming a correlation, interrupting a synapse and adapting a weight of another synapse, comparing reactions of the network, and then eliminating a synapse, as required by claim 1. In contrast, this procedure merely checks the weights of synapses in making a determination of whether to eliminate the synapse. Thus, this procedure does not anticipate the invention recited in claim 1.

The second procedure calls for determining the effect that a change in the synapse weight has on network output, and eliminating synapses if the change is acceptable. The change in synapse weight is not disclosed to be based on a weight of another synapse having a different sending neuron and the same receiving neuron, as required by claim 1. Further, no pair of neurons is selected for weight adaptation and no correlation assumption is made, also as required by claim 1. Thus, this procedure does not anticipate the invention recited in claim 1.

The third procedure calls for pruning input nodes, and does not address identifying and eliminating synapses. Thus, this procedure does not anticipate the invention recited in claim 1.

The fourth procedure calls for identifying weights to be pruned from a network by examining the second derivatives of the error function contained in the Hessian matrix, using a formula to approximate the change in output resulting from a small perturbation in a selected weight. Pairs of neurons are not selected, weights are not substituted, and

actual changes based on the substitution are not made, as required by claim 1. Thus, this procedure does not anticipate the invention recited in claim 1.

In summary, Mehrotra et al. describe four pruning procedures for simplifying a neural network. None of these procedures includes all of the elements of the method recited in claim 1. That is, none of the disclosed procedures includes the process of selecting first and second sending neurons that are connected to the same receiving neuron by respective first and second synapses, assuming a correlation of response signals from said first and second sending neurons to the same receiving neuron, interrupting the first synapse and adapting in its place a weight of the second synapse, comparing the output signals of the changed neural network with the output signals of the unchanged neural network, and if the comparison result does not exceed a predetermined level, eliminating the first synapse, as recited in claim 1. The rejection of claim 1, therefore, should be withdrawn.

Claims 2-11 depend from claim 1, and therefore also are not anticipated by Mehrotra et al., for the reasons noted with respect to claim 1, and in view of the additional features recited in the dependent claims. For example, claim 2 recites that the first and second selected sending neurons are located on the same layer. The examiner noted that Mehrotra et al. disclose sending neurons located on the same layer, in Fig. 1.14. Fig. 1.14 does show that sending neurons exist on the same level, but not that two sending neurons selected as part of the process recited in claim 1 are located on the same layer, because that process is not disclosed by Mehrotra et al. For at least the reasons noted above, Mehrotra et al. also does not anticipate the invention recited in claims 2-11. The rejection of these claims, therefore, should be withdrawn.

Based on the foregoing, it is submitted that all requirements have been satisfied, and that all objections and rejections have been overcome. It is therefore requested that the Amendment be entered, the claims allowed, and the case passed to issue.

Respectfully submitted,

July 21, 2004
Date

Thomas M. Champagne
Registration No. 36,478
IP STRATEGIES
12 ½ Wall Street
Suite I
Asheville, North Carolina 28805
828.253.8600
828.253.8620 fax

TMC:hlp